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(54) Portable road markers

(57) In a method of providing a reflective surface on a portable traffic bollard of conical or cylindrical form, a length of adhesive-backed reflective tape (14) is wound onto the bollard (2) in helical or annular fashion, the tape being sufficiently flexible (as defined in the specification) to bend in its own plane without wrinkling. One form of apparatus for applying the tape comprises a hub (32) bearing a roll of tape (14) and a contact roll (40) for applying it to the bollard surface. The tape (14) is normally maintained under tension as it is applied by a brake shoe (25). The bollard is mounted on a support for rotation as the tape (14) is applied and provision is also made for relative axial movement of the bollard and hub as necessary to ensure creation of the desired design.

As an alternative to the tape-winding technique a reflective sheet blank is provided on its reverse surface with a pressure sensitive adhesive defining a grid pattern. Once roughly located on the bollard, the grid pattern permits the blank to be shifted before pressure applied on the grid areas finally secures the sheet in place.

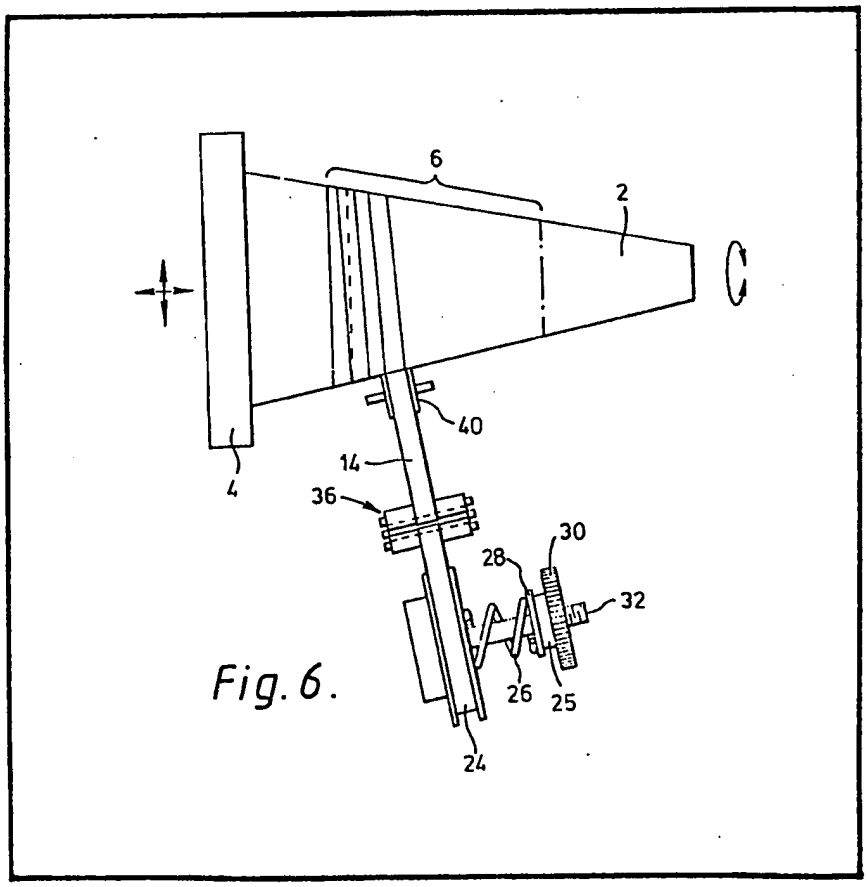

Fig. 6.

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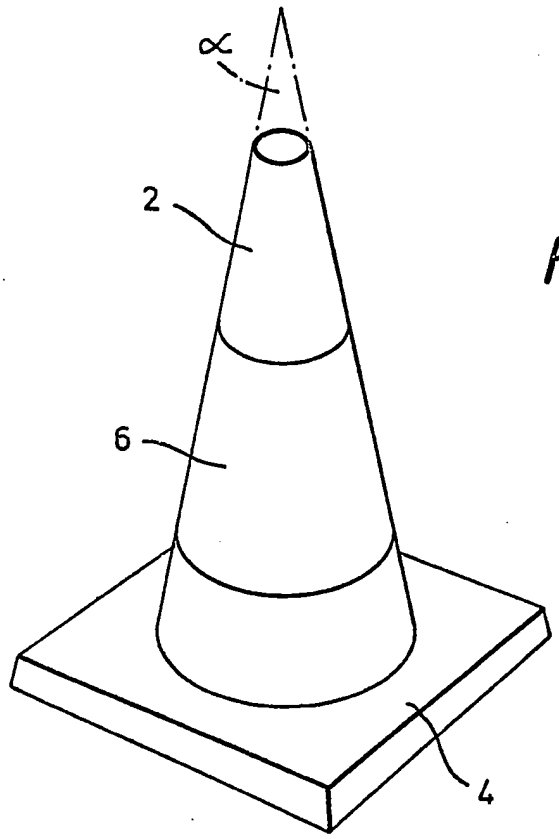


Fig.1.

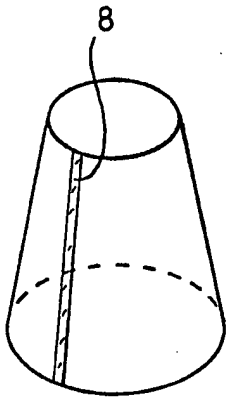
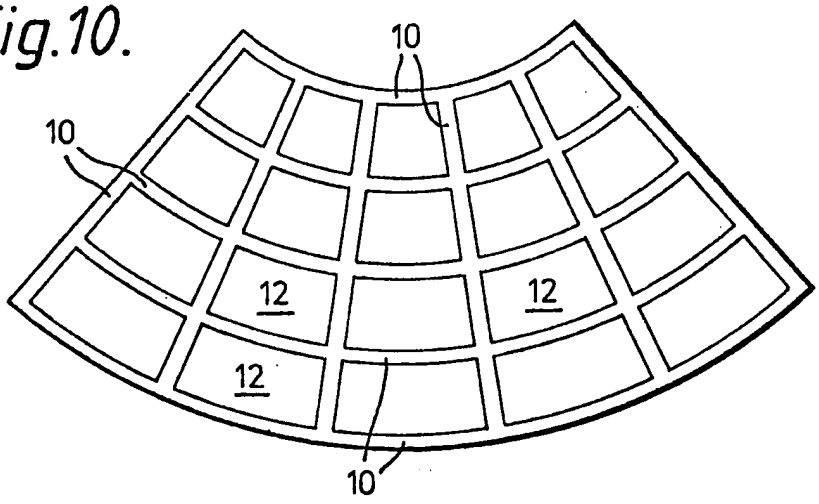


Fig. 2.

Fig.10.



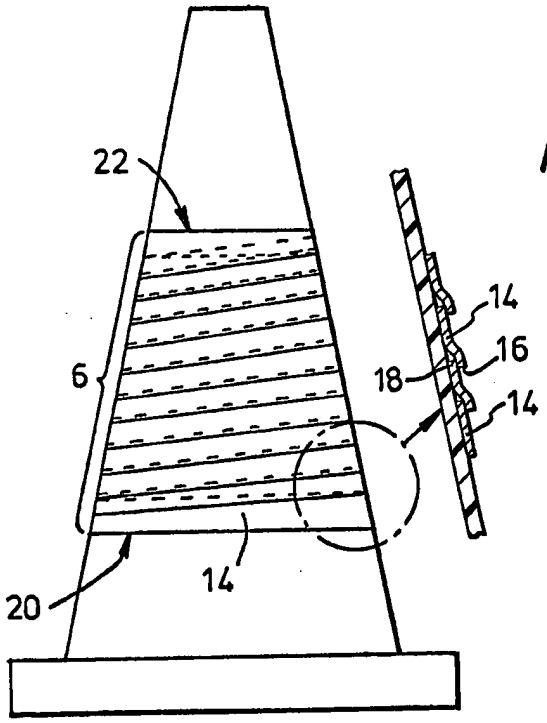


Fig. 3.

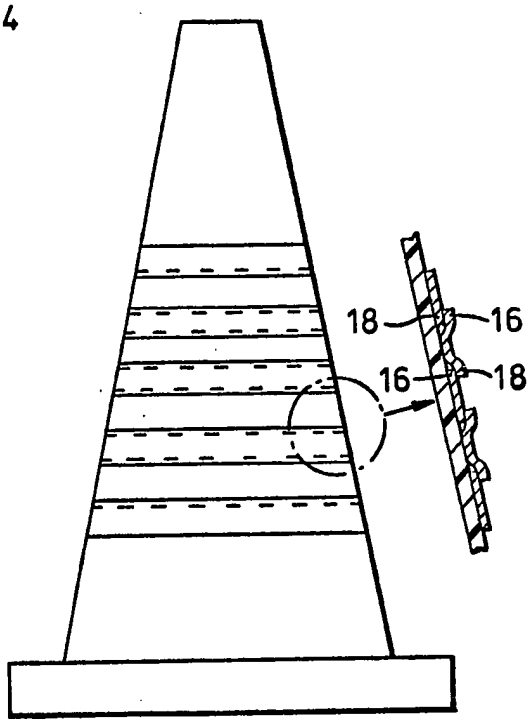


Fig. 4.

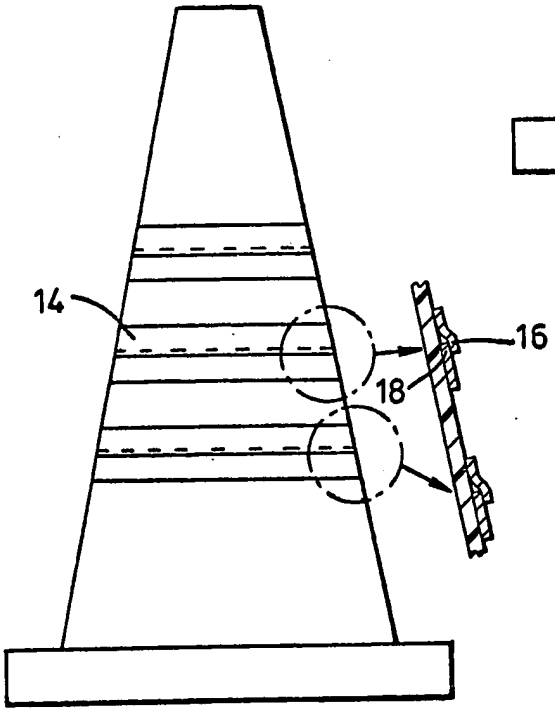


Fig. 5.

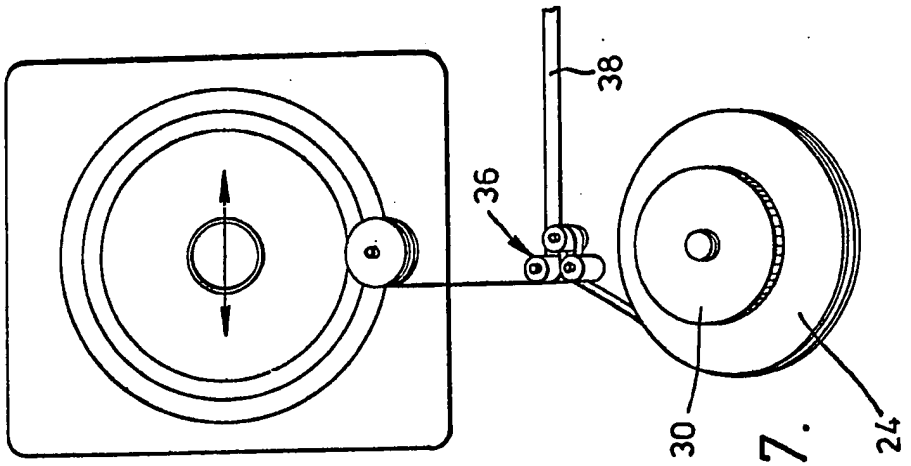


Fig. 7.

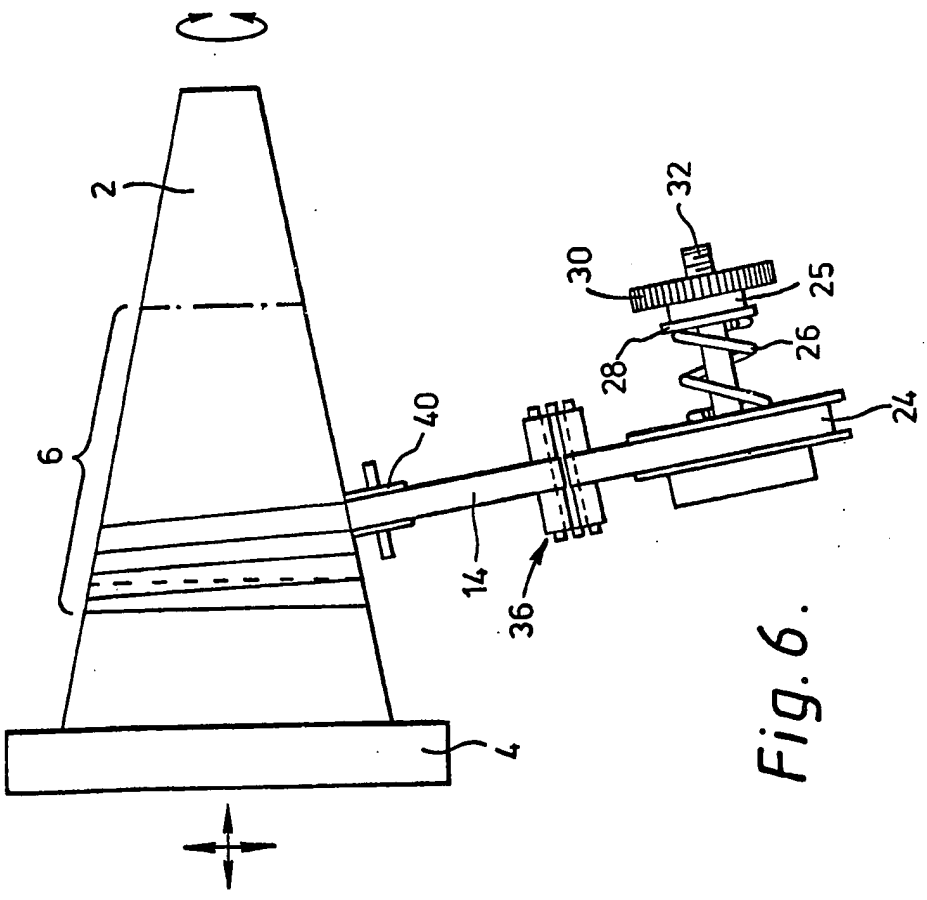


Fig. 6.

Fig. 9.

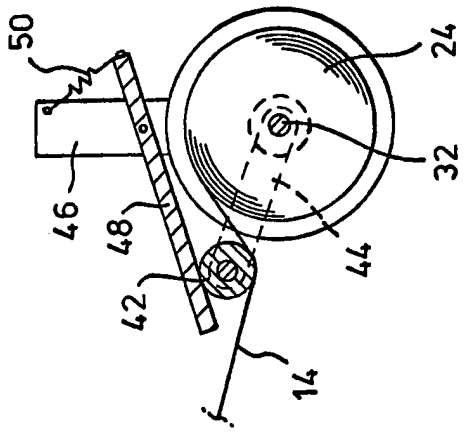
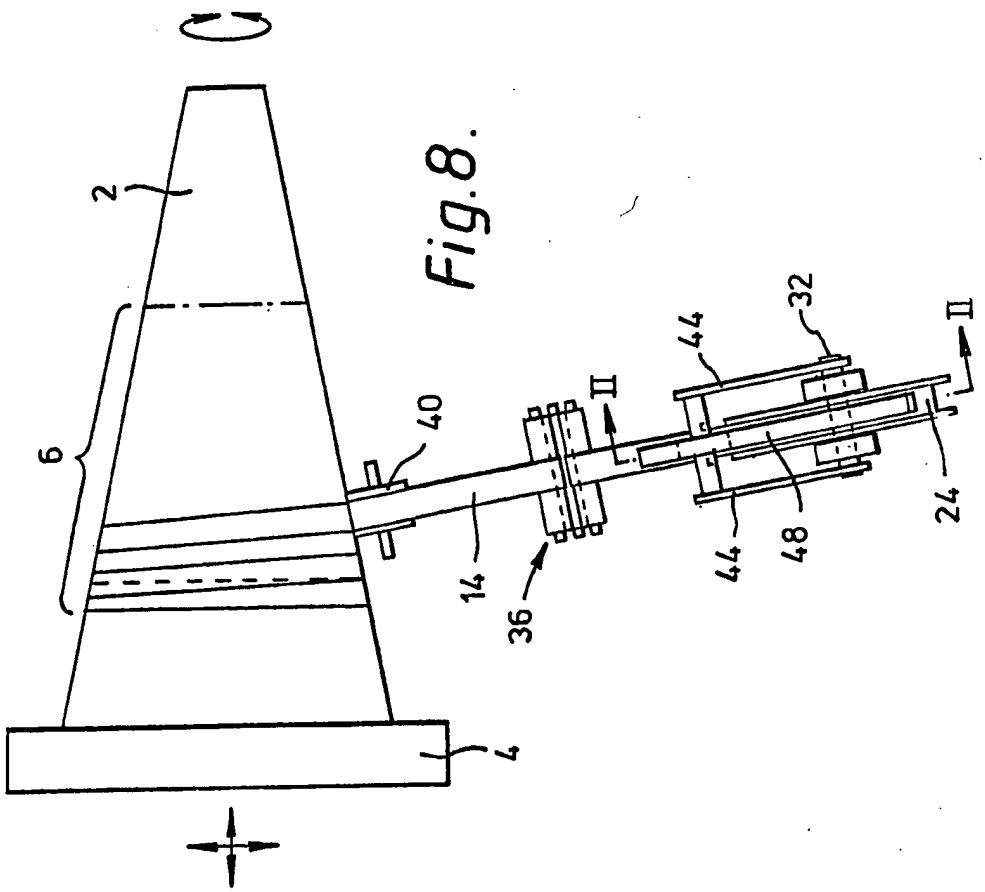


Fig.8.



SPECIFICATION
Traffic cones

This invention relates to traffic guidance systems and more particularly to bollards of cylindrical or conical design.

In recent years, there has been a need for providing a traffic bollard, particularly those which are portable, with a visible surface area of which at least a portion is reflex- or retro-reflective. Portable bollards are typically moulded in plastics materials and while suitable reflective sheet materials are known, the application of such materials to curved surfaces of the bollards in a secure manner has always been a problem. This is especially true in the case of conical bollards where a frusto-conical section of the bollard must be covered. The adhesive used must of necessity be aggressive and this can result in the applied sheet being clumsily secured. The consequence is an imperfect product from which the reflective material can become detached because of insecure adhesion.

An exact match between the reflective material and the bollard is desirable for the above reasons and also where the material is to be applied to a cylindrical bollard. As the precise dimensions of bollards, both cylindrical and conical, vary substantially, this exact matching of the reflective material to bollards is difficult to achieve on a commercial manufacturing scale.

In an attempt to mitigate the above problems, the present invention contemplates the use of a reflective material in the form of a continuous strip which is wound round and adhesively secured to the chosen surface area. According to the invention, a method of providing a reflective surface on at least a portion of a traffic bollard comprises providing a flexible adhesive backed tape having a reflective surface and a width to stretchability ratio not greater than 1.2 wherein the width is measured in millimeters and the stretchability is measured as the percentage elongation at break; and winding round and adhesively securing the tape to at least a portion of the external surface of the bollard. The tape is sufficiently flexible to bend in its own plane over a wide range of surface contours without wrinkling and without impairing its inherent reflectivity. We have found that a retro-reflective material can be adapted to fulfil these requirements by selecting a suitable range of tape widths and stretchabilities. The ratio of width to stretchability is preferably as low as possible.

A suitable retro-reflective sheet material for use in tape formed in the present invention is based on a sheeting sold in the United Kingdom under the registered Trade Mark SCOTCHLITE by 3M (United Kingdom) Ltd. In order to have the requisite stretchability though, the thickness of its substrate should preferably be limited to about 0.075 millimetres. A substantially thicker substrate results in stretching difficulties in use, while a thinner substrate can lead to premature breakage in stretching. For most applications, an elongation at break of at least 14% is sufficient and up to 30% is possible without the uniformity of the reflective surface coating being impaired. An elongation at break in the range 20 to 25% is preferred.

It is desirable of course that the tape is as wide as possible in order to minimize the number of passes or turns it must take to cover the chosen surface area. We have found that widths in excess of 20 millimetres are often insufficiently flexible in the plane of the tape and a width in the range 17 to 19 millimetres is preferred. A tape width of 17 millimetres and an elongation at break of 25% results in a width/stretchability ratio of 0.68.

When applying the tape to a bollard, the tension should be carefully controlled. It must be sufficient to maintain smooth application of the tape and effect the differential stretching necessary to ensure proper coverage of the respective surface area. It should also be borne in mind that bollards can expand and contract in use as a consequence of variations in the ambient temperature and the tension with which the tape is applied is also preferably sufficient to maintain it in tension after application under all reasonably predictable conditions. Further, the tension should take account of the angle of the helix (if adopted) wound on the bollard in relation to the included apex angle of the bollard. In some circumstances, the temperature and speed of application are also factors.

The invention also provides apparatus for carrying out the method defined above, which apparatus has a support for a bollard on which the reflective surface is to be provided; and an applying mechanism comprising a hub for supporting a roll of adhesive tape, and a contact roll for applying the tape to the bollard; means being provided for rotating one of the support and applying mechanism relative to the other as the tape is applied.

The apparatus preferably includes means for feeding the tape thereto under tension; and also means for shifting the feeding means relative to the supporting and rotating means parallel to the axis of the bollard so that the tape may be helically wound onto the bollard. An adjustable brake can be used for maintaining tension in the tape, and this brake can act directly on the tape spool. However, because the effective diameter of the spool of tape reduces as the tape is used, the brake can require adjustment during the winding process to maintain sufficient uniformity of tension while a spool of tape is consumed. To avoid any need for such adjustment, a braking mechanism can be employed which acts directly on the tape, and which provides a braking force less dependent on the diameter of the spool from which the tape is drawn.

As an alternative means of meeting the first of the problems discussed above, the invention further provides a sheet of reflective material shaped for adhesive securement to a predetermined surface area, which sheet has a pressure-sensitive adhesive in the form of a grid

on one face thereof, the grid being delineated by areas on the face projecting above the level of the adhesive. In use, this sheet may be located on the receptor surface, and slid around on the projecting areas until the precise position is found. At that point, the lines of adhesive may be pressed against the receptor surface to secure the sheet in place. Typically, in the manufacture of the sheet, the entire one face thereof is coated with adhesive, smaller pieces of liner or other material being secured thereover to define the projecting areas. A liner material is usefully employed as this may have the grid marked out on it with score lines, the whole one face of the sheet being initially covered at the manufacturing stage to protect the adhesive, and the grid alone being removed prior to application of the sheet to the receptor body.

The invention will now be described by way of example and with reference to the accompanying drawings wherein:—

Figure 1 is a perspective view of a common form of conical bollard with a reflective coating thereon;

Figure 2 shows a perspective view of a frusto-conical sleeve for forming the reflective surface on the bollard of Figure 1;

Figures 3 to 5 show various styles in which a reflective tape may be applied to a bollard in accordance with the invention;

Figure 6 is an elevation of appratus for applying a reflective tape to a bollard in the style of Figure 3;

Figure 7 is a plan view of the apparatus of Figure 6;

Figure 8 is an elevation of a modified apparatus for applying a reflective tape to a bollard in the style of Figure 3;

Figure 9 is a sectional view taken on the line IX—IX of Figure 8; and

Figure 10 shows a developed view of the sleeve of Figure 2 with a grid of adhesive formed thereon in accordance with the invention.

The bollard shown in Figure 1 is typical of many in current use. It comprises a conical portion 2 mounted on a square base 4. Such bollards are commonly integrally moulded in a plastics material. An area 6 of the cone 2 is provided with a reflective coating, which is normally in the form of a sleeve dimensioned to match the cone.

Bollards of the type illustrated in Figure 1 are produced in many different sizes, the overall height being normally not greater than 1300 mm and the included apex angle α of the cone generally not exceeding 20°. The height of the reflective sleeve is usually not greater than 530 mm and may comprise a plurality of narrow bands of as little as 10 mm. The cone cross-section need not always be circular either; bollards of this general type are also available with polygonal such as triangular or square cross-sections. Further, cylindrical or tubular bollards having a region of uniform cross-section are also in common use for example on motorways.

Figure 2 shows a perspective view of a conical sleeve of reflective material for application to a bollard of the type shown in Figure 1.

It will immediately be appreciated that with exposed adhesive on the inner surface thereof, precise location and securement on a cone is difficult if not impossible. The sleeve is formed into a frusto-cone from a shaped blank and welded along the seam 8, so neither is the removal of a release liner an easy exercise either. It is though sometimes permissible to apply the material without first forming a frusto-cone. However, this requires very precise initial location of the blank on the cone.

As shown in Figure 3, a tape 14 of reflective material is helically wound on a cone with adjacent edges 16, 18 of the tape overlapping as shown in the inset. The tape is sufficiently differentially flexible to complete a first horizontal circuit of the cone at the bottom 20 of the area 6 and continue into and through the helix. Similarly, it can accomplish the reversion into and complete a second horizontal turn at the top 22 to cover the entire frusto-conical area 6, with only a single circular tape/cone interface at either extremity. The technique may be varied to use a plurality of lengths of tape, each defining a separate annulus, as shown in Figure 4 with alternate lengths overlapping along both edges (see inset). In another alternative, the surface 6 may be covered with a plurality of horizontal annuli, each comprising contiguous lengths of tape adjacent ones overlapping. This is particularly suitable where an hooped formation is required as shown in Figure 5. In a further alternative (not shown) the winds of a helix formed by a single length of tape may be spaced to present an inclined stripe or screw-thread appearance. A large variety of designs are available.

Figures 6 and 7 show apparatus for applying reflective tape to a bollard generally in the style shown in Figure 3. Means (not shown) are provided for supporting the bollard and rotating it either automatically or at specific rates and times which are controlled by the operator. The tape 14 is fed from a supply roll 24 mounted on a spindle with an adjustable brake. The brake comprises a spring 26 fixed to the roll 24 and a plate 28 and a knurled knob 30 screw-threaded onto a spindle 32. Between the knob 30 and the plate 28 is a brake shoe 25, which may be keyed to the spindle 32 and rotation of the knob 30 can increase or decrease the applied braking force against the plate 28 and thereby on the roll 24. The tape 14 passes from the roll 24 through tensioning and weeding rolls 36, at which stage a release liner 38 is removed from the tape, to a contact roll 40. To apply the tape, the bollard is rotated and the requisite tension is maintained by the rolls 36 and the adjustable brake. The bollard, the supply roll, the tensioning rolls and the contact roll are all mounted of the same frame on which the bollard can be moved axially with respect to the other components as winding is continued. This can be effected manually or automatically as desired.

A modification of the apparatus of Figures 6 and 7 is shown in Figures 8 and 9. In this case the means for maintaining tension in the tape as it is wound on the bollard 2 acts directly on the tape, rather than on the spindle. A brake wheel 42 is rotatably mounted on a chassis 44 which is in turn pivotally mounted on the spindle 32 outside of the spool 24. A frame 46 fixed relative to the spindle 32 pivotally supports a brake shoe 48 which is urged against the wheel 42 by a spring 50. The wheel 42 can be made of a hard rubber which contacts the tape 14 in non-sliding engagement and the brake shoe in steel. The strength of the spring 50 is selected to provide the requisite braking force to the wheel 42 to control and maintain the desired tension in the tape 14 as it is wound on the bollard 42.

The location of the wheel 42 is not critical, and the apparatus of Figures 8 and 9 may be adapted such that the common tangent at the point of contact between the wheel 42 and tape 14 is tangential to the spool 24; and by mounting the wheel 42 in a different manner, for example on a chassis pivotally supported on a second spindle spaced from the spindle 32, the wheel may act directly on the main body of tape as yet unwound from the spool 24. In such an embodiment, the brake would act substantially radially of the spool 24.

The direct action of the brake on the tape 14 enables a more uniform tension to be maintained in the tape 14, and the brake requires minimal, if any, adjustment while the winding process is carried out. It will be appreciated that, particularly where the tape on the spool has a removable liner, the braking wheel may act on either surface of the tape.

Both winding apparatus described can be used to wind tape onto a bollard in a variety of ways. Particularly, it can be used to apply a series of axially spaced frusto-conical sections by completing a first section, shifting the contact roll 40 axially relative to the bollard, applying a second section, and repeating as desired. For this purpose, it is advantageous to incorporate in the contact roll (40) mechanism a cutting device which severs the tape at the end of one section, and means for making the free end of the tape 14 available for ready application at the start of the next.

The tape used is normally spliceable, and means can be provided for automatically halting the operation of the machine as a spool is near to running out of tape, before the final length is drawn through the tensioning and weeding rolls 36. A new spool can then be fitted and spliced to the end of the previous spool. A winding process can then be restarted without having to rethread the tape.

For conical bollards, the rotating means for the bollard can be controlled to vary its speed of rotation so that the speed of application of the tape can be maintained substantially constant. We have found also that the tape is preferably maintained at a slightly elevated temperature to preserve its width stretchability ratio. A temperature in the range 19° to 27°C is preferred, best performance being achieved when the tape is at a temperature of 22 to 25°C. In practice, it is sufficient merely to store spools of tape at a suitable temperature, and apply it in ambient conditions immediately after removal from the store, unless the ambient conditions are particularly severe.

A sheet material for application to a cone of the kind shown in Figure 1 more in the manner of the prior art but providing easier location is shown in Figure 10. A sheet blank is formed with a grid of adhesive on the reverse face thereof as shown. The lines 10 of the grid are delineated by islands 12 formed by pieces of liner or other material adhere to the blank by means of the same adhesive that is exposed along the lines 10. The blank can then be loosely located on the cone and slid into precise position before applying pressure to the grid lines 10 to secure it in place. If desired, the blank may first be formed into a sleeve as shown in Figure 2.

Although this technique suffers from a certain lack of flexibility, as each blank or sleeve must be matched to the bollard to which it is to be applied, this can be acceptable in some circumstances, and where large numbers of identical bollards are to be produced, the technique can be economic and efficient.

Claims

1. A method of providing a reflective surface on at least a portion of a traffic bollard, which method comprises providing a flexible adhesive backed tape having a reflective surface and a width to stretchability ratio not greater than 1.2 wherein the width is measured in millimeters and the stretchability is measured as the percentage elongation at break; and winding round and adhesively securing the tape to at least a portion of the external surface of the bollard.

2. A method according to Claim 1 wherein the tape is wound around the bollard in a helical manner with contiguous lengths of tape overlapping.

3. A method according to Claim 1 wherein a first length of tape is wound around the bollard in a helical manner with contiguous winds of tape spaced from one another; and wherein a second length of tape is wound around the bollard between and overlapping said contiguous winds of first length of tape.

4. A method according to any preceding Claim wherein the bollard is conical.

5. A method according to any preceding Claim wherein the length of tape is first wound around the bollard with an edge thereof in a plane perpendicular to the bollard axis, and then led into a helical path around the bollard.

6. A method according to any preceding Claim wherein the stretchability of the tape is in the range 14 to 30% elongation at break.

7. A method according to Claim 6 wherein said stretchability is in the range 20 to 25%.

8. A method according to any preceding Claim wherein the width of the tape does not exceed 20 millimeters.

9. A method according to Claim 8 wherein the width of the tape is in the range 17 to 19 millimeters.

10. A method according to any preceding Claim wherein the tape is applied to the bollard under tension.

11. Methods of providing a reflective surface on at least a portion of a traffic bollard substantially as described herein with reference to the accompanying drawings.

12. A traffic bollard provided with a reflective surface on at least a portion thereof by a method according to any preceding Claim.

13. Apparatus for carrying out a method according to any preceding Claim having a support for a bollard on which the reflective surface is to be provided; and an applying mechanism comprising a hub for supporting a roll of adhesive tape, and a contact roll for applying the tape to the bollard; means being provided for rotating one of the support and applying mechanism relative to the other as the tape is applied.

14. Apparatus according to Claim 13 including means for moving one of the support and applying mechanism relative to the other parallel to the support axis as the tape is applied.

15. Apparatus according to Claim 13 or Claim 14 including means for maintaining the tape under tension during its application.

16. Apparatus according to Claim 15 wherein the maintaining means comprises a brake acting on the supporting hub.

17. Apparatus according to Claim 16 wherein the maintaining means includes a set of tensioning rolls.

18. Apparatus for applying an adhesive tape to a bollard substantially as described herein with reference to Figures 6 and 7 or Figures 8 and 9 of the accompanying drawings.

19. A sheet of material for adhesive securement to a predetermined surface area, having a reflective surface on one face thereof and a pressure sensitive adhesive on the other face in the form of a grid delineated by areas on said other face projecting above the level of the adhesive.

20. A sheet of material according to Claim 19 wherein said areas are defined by pieces of liner material.

21. A sheet of material according to Claim 20 wherein the grid is revealed by removal of a liner material from the lines thereof.

22. A sheet of material for adhesive securement to a predetermined surface area, having a reflective surface on one face thereof; a layer of pressure sensitive adhesive on the other face thereof, and a liner covering the adhesive layer, the liner being scored to define a grid thereon, the portions of the liner defining the grid being removable from the adhesive layer in preference to the remaining portions.

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